

5 **WHAT IS CLAIMED IS:**

1. An isolated nucleic acid comprising an everninomicin biosynthetic pathway gene product from a *Micromonospora carbonacea*.
- 10 2. The isolated nucleic acid of claim 1, which encodes a gene product selected from everninomicin biosynthetic enzymes and proteins listed in Tables 1a and 1b.
3. The isolated nucleic acid of claim 2, which is DNA.
- 15 4. The isolated nucleic acid of claim 3, which comprises a coding sequence from the nucleotide sequence as depicted in SEQ ID NO:1, or the complement thereof.
5. The isolated nucleic acid of claim 4, wherein the nucleotide sequence is selected from the group consisting of CDS sequences listed in Tables 1a and 1b.
- 20 6. The isolated nucleic acid of claim 1, wherein the gene product is involved in orsellinic acid biosynthesis.
7. The isolated nucleic acid of claim 1, wherein the gene product is a sugar
- 25 biosynthetic gene product.
8. The isolated nucleic acid of claim 1, wherein the gene product is a glycosyltransferase.
- 30 9. The isolated nucleic acid of claim 1, wherein the gene product is a tailoring enzyme.
10. The isolated nucleic acid of claim 1, wherein the gene product is a regulatory gene product.
- 35 11. The isolated nucleic acid of claim 1, wherein the gene product is involved in a resistance mechanism.

5 12. An expression vector comprising a nucleic acid of claim 1 operably associated with an expression control sequence.

 13. A host cell containing the expression vector of claim 12.

10 14. The host cell of claim 13, which is a bacterial host cell.

 15. The host cell of claim 14, which is an *E. coli* or an actinomycete.

 16. The host cell of claim 15, which is *Streptomyces* or *Micromonospora*.

15 17. A method for expressing an everninomicin biosynthetic pathway gene product from a *Micromonospora carbonacea*, comprising culturing a host cell of claim 16 under conditions that permit expression of the everninomicin biosynthetic pathway gene product.

20 18. An isolated polypeptide, which is an everninomicin biosynthetic pathway gene product from a *Micromonospora carbonacea*.

 19. The isolated polypeptide of claim 18, which comprises an amino acid sequence selected from SEQ ID NOS:2-88 and 96-106.

25 20. A modified *Micromonospora carbonacea*, wherein an everninomicin biosynthetic pathway gene is knocked-out.

 21. A modified *Micromonospora carbonacea*, wherein an everninomicin
30 biosynthetic pathway gene is over-expressed.

 22. The modified *Micromonospora carbonacea* of claim 21, wherein the over-expressed biosynthetic pathway gene is a bottle-neck gene.

35 23. A vector comprising a *Micromonospora carbonacea* everninomicin biosynthetic pathway resistance gene product.

5 24. A method of selecting for a transfected or transformed host cell, comprising selecting a host cell containing the vector of claim 23 and cultured in the presence of an amount of everninomicin that is toxic to the host cell which does not contain the vector.

 25. An isolated nucleic acid encoding a *Micromonospora* site-specific integrase.

10 26. The isolated nucleic acid of claim 25, wherein the site-specific integrase has an amino acid sequence as depicted in SEQ ID NO:89.

 27. The isolated nucleic acid of claim 26, wherein the site-specific integrase has a
15 nucleotide sequence as depicted in SEQ ID NO:90.

 28. A vector for integration in an actinomycete host cell comprising the nucleic acid
of claim 25.

20 29. The vector of claim 28, further comprising a heterologous gene operatively associated with an expression control sequence.

 30. The vector of claim 29, wherein the heterologous gene is an everninomicin
biosynthetic pathway gene.

25 31. A method for introducing a heterologous gene into an actinomycete, comprising introducing the vector of claim 28 into the actinomycete.

 32. The method according to claim 31, wherein the actinomycete is of the genus
30 *Micromonospora*.

 33. The method according to claim 32, wherein the vector expresses an everninomicin biosynthetic pathway gene product.

35 34. The method according to claim 33, wherein the everninomicin biosynthetic pathway gene is a bottleneck gene.